

Remarks

Claims 1-24 are pending herein. By this Amendment, claims 1 and 6-9 have been amended.

Claim 1 has been amended to limit the silicon compound(s) to non-sulphur-containing silicon compound(s) and the sulphur compound(s) to non-silicon-containing sulphur compound(s). Support for this amendment can be found, e.g., in the specification at page 7, line 10 through page 8, line 17, which lists only non-sulphur-containing silicon compounds and non-silicon-containing sulphur compounds.

Claims 6-9 have been amended to be consistent with the amendment to claim 1.

In the Office Action, claims 1-12 and 19-21 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,922,192 to Zimmerman et al. ("Zimmerman '192") in view of U.S. Patent No. 5,656,150 to Reed et al. ("Reed"); and claims 13-18 and 22-24 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Zimmerman '192 in view of Reed and further in view of U.S. Patent No. 5,849,176 to Zimmerman et al. ("Zimmerman '176") and U.S. Patent No. 4,410,418 to Kukes et al. ("Kukes").

In view of the amendments and remarks herein, Applicants respectfully request reconsideration and withdrawal of the rejections set forth in the Office Action.

I. Rejection of Claims 1-12 and 19-21

Claims 1-12 and 19-21 are rejected under §103(a) as being unpatentable over "Zimmerman '192 in view of Reed.

Zimmerman is cited for teaching a method for treating the heat exchanger surfaces in reactors and/or heat exchangers of installations for converting hydrocarbons and other organic compounds at high temperatures in the gaseous phase (col. 3, lines 20-28). The metallic surfaces coming into contact with the organic substances are treated at a temperature of 300 to 1000°C, over a period of 0.5 to 12 hours, with a mixture of silicon and sulfur containing product and a dry gas flow which is inert with respect to silicon- and sulfur-containing product (col. 3, lines 20-29). According to the Examiner, Zimmerman describes each aspect of instant claim 1 except that the treatment in claim 1 is carried out in the presence of steam instead of an inert gas. Zimmerman

is further cited for disclosing that a carrier gas other than the inert gas for the system can also be used (col. 4, line 64). Furthermore, according to the Office Action:

Zimmerman explores the possibility of using steam as a carrier gas as disclosed in his example 6 and concludes that steam is not suitable for long lasting suppression of coking on materials pretreated with trimethylsilylmethylmercaptan (col. 7, lines 45-53).

Reed is cited for teaching a novel method for treating the radiant tubes of a fired pyrolysis heater with an antifoulant composition for inhibiting the formation and deposition of coke thereon (Abstract). The Office Action cites Reed's claim 5, which states that the diluent fluid is steam.

For the reasons given below, Applicants respectfully submit that instant claim 1 (as amended herein) and claims 2-12 and 19-21 would not have been obvious over Zimmerman '192 in view of Reed.

Claim 1 has been amended to limit the silicon compound(s) to non-sulphur-containing silicon compound(s) and the sulphur compound(s) to non-silicon-containing sulphur compound(s). Thus, in claim 1, the silicon compound does not contain sulfur and the sulfur compound does not contain silicon.

As noted in the Office Action, Zimmerman '192 explores the possibility of using steam as a carrier gas in Example 6 therein. Zimmerman '192 states that in Example 6 that "the influence of the carrier gas used for pretreatment on the coking rate during pyrolysis of n-heptane was investigated." The compound used in the steam was trimethylsilylmethyl mercaptan. As the Examiner points out, Zimmerman '192 states that the "variation in the carrier gas used for pretreatment shows that steam is not suitable for long-lasting suppression of coking on materials pretreated with trimethylsilylmethyl mercaptan." In this Example, Zimmerman '192 teaches away from the use of steam as a carrier for trimethylsilylmethyl mercaptan, a compound containing both silicon and sulfur. Zimmerman '192 does not teach or suggest the use of steam as a carrier for separate silicon and sulfur compounds, i.e., silicon compounds not containing sulfur and sulfur compounds not containing silicon. Furthermore, in Example 6,

Zimmerman '172 teaches that the particular carrier gas does influence the effectiveness of the pretreatment. While the Example teaches that steam is not suitable for use with trimethylsilylmethyl mercaptan, Zimmerman '192 does not teach or suggest whether steam would be effective with other silicon-sulfur-containing compounds or with a combination of at least one silicon-containing (but non-sulfur-containing) compound and at least one sulfur-containing (but non-silicon-containing) compound. Thus, Zimmerman '192 itself provides no motivation, reason or suggestion to use steam with a silicon compound and a sulfur compound, the silicon compound not containing sulfur, and the sulfur compound not containing silicon.

Reed uses steam with an antifoulant composition containing tin and silicon. Reed does not teach or suggest the use of steam with an antifoulant composition containing a silicon compound and a sulfur compound. Therefore, Reed does not teach that steam would be an effective carrier for a composition containing at least one silicon compound and at least one sulfur compound, the silicon compound not containing sulfur and the sulfur compound not containing silicon. As pointed out above, Zimmerman '192's Example 6 teaches that steam is not effective with a specific sulfur-silicon compound, i.e., trimethylsilylmethyl mercaptan, but the patent does not teach whether steam would be effective with a silicon compound and a sulfur compound, the silicon compound not containing sulfur and the sulfur compound not containing silicon. Thus, Applicants respectfully submit that one skilled in the art would not have been motivated by either Zimmerman '192 or Reed to combine steam with a composition containing at least one silicon compound and at least one sulfur compound, wherein the silicon compound does not contain sulfur and the sulfur compound does not contain silicon. Accordingly, Applicants respectfully submit that Zimmerman '192 in view of Reed would not have rendered instant claims 1-12 and 19-21 obvious.

II. Rejection of Claims 13-18 and 22-24

Claims 13-18 and 22-24 are rejected under 103 as being unpatentable over Zimmerman '192 in view of Reed and further in view of Zimmerman '176 and Kukes.

Zimmerman '176 is cited for showing in Fig. 3 therein the influence of 85 ppm dimethyl disulfide as an addition to n-heptane on the rate of coke formation (see col. 5, lines 16-18).

Zimmerman '192 does not add a silyl compound in the feedstock of the organic compound to be cracked. Zimmerman '176 discloses a process for producing thermally cracked products from hydrocarbons while simultaneously reducing the coke deposits on the heat exchange surfaces by adding to the feed to be cracked, before the cracking temperature is reached, 20 to 1000 ppm of an additive composition that is selected from among one or more volatile organic compounds containing silicon and sulfur (see col. 2, lines 27-33). According to the Office Action, it would have been obvious to combine the teachings of the Zimmerman '192 and Zimmerman '176 patents because it is advantageous to treat the hydrocarbons to be thermally cracked, before the actual cracking temperature is reached, with an additive that consists either of a volatile compound containing silicon and sulfur in the atomic ratio of 5:1 to 1:1 or of a mixture of a compound containing silicon and a compound containing sulfur in the same atomic ratio (see Zimmerman '176 at col. 3, lines 45-51).

The Office Action further states that although Zimmerman '192 does not mention the use of hexamethyldisiloxane, Zimmerman '176 discloses that the compound containing silicon and/or sulfur is preferably selected from the group consisting of trimethylsilyl mercaptan, dimethyl sulfide, tetramethyl silane, bis trimethylsilyl sulfide, and their mixtures. Other volatile compounds can also be used (see Zimmerman '176 at col. 2, lines 65-67 and col. 3, lines 1-2).

Kukes is cited for disclosing a method for reducing the formation of coke on the metals which are contacted with a gaseous stream containing hydrocarbons in a thermal cracking process by contacting the metals with a halogen-containing silicon compound from the group consisting of halogen-containing silanes, disilanes and siloxanes (see col. 8, lines 5-13).

According to the Office Action, it would have been obvious to combine the teachings of Zimmerman '192 with those of Zimmerman '176 and Kukes because the use of hexamethyl-disiloxane is preferred over other silicon compounds.

Zimmerman '176 is further cited for showing in Figure 3 therein the influence of adding dimethyl disulfide to the cracking stock (n-heptane) on the rate of coke formation. Zimmerman '176 is also cited for disclosing treatment of the hydrocarbons to be cracked before the actual cracking temperature is reached, with an additive that consists of silicon and sulfur in the atomic

ratio of 5:1 to 1:1 (see col. 3, lines 45-50). In Example 10 therein, Zimmerman '176 discloses the use of 100 ppm of an equimolar mixture of tetramethylsilane and dimethylsulfide in n-heptane for cracking reactions (col. 7, lines 27-28). According to the Office Action, it would have been obvious to have modified the process in Zimmerman '192 by including silicon with sulfur as suggested by Zimmerman '176 because the use of silicon and sulfur is preferred for reduction of coking. In addition, according to the Office Action, it would have been obvious to combine the teachings of Zimmerman '192 with those of Zimmerman '176 and Kukes to obtain the desired concentration and ratio of silicon and sulfur.

Applicants respectfully submit that claims 13-18 and 22-24 would not have been obvious over Zimmerman '192 in view of Reed and further in view of Zimmerman '176 and Kukes.

Claims 13-18 and 22-24 depend directly or indirectly upon claim 1. As discussed above, claim 1 has been amended to limit the silicon compound(s) to non-sulphur-containing silicon compound(s) and the sulphur compound(s) to non-silicon-containing sulphur compound(s). For the reasons given above, Applicants submit that Zimmerman '192 and Reed would not have rendered amended claim 1 obvious. Specifically, Applicants submit that one skilled in the art would not have been motivated by either Zimmerman '192 or Reed to combine steam with a composition containing at least one silicon compound and at least one sulfur compound, wherein the silicon compound does not contain sulfur and the sulfur compound does not contain silicon. Applicants further submit that Zimmerman '176 and Kukes, in combination with Zimmerman '192 and Reed, do not provide the motivation to combine steam with a composition containing at least one silicon compound and at least one sulfur compound, wherein the silicon compound does not contain sulfur and the sulfur compound does not contain silicon, and to use such combination to pretreat the metal surfaces coming into contact with the organic substance to be cracked. Therefore, Zimmerman '176 and Reed do not cure the failure of Zimmerman '192 and Reed to render amended claim 1 obvious. Accordingly, Applicants respectfully submit that claims 13-18 and 22-24 would not have been obvious over Zimmerman '192 in view of Reed and further in view of Zimmerman '176 and Kukes.

III. Conclusion

In view of the amendments and remarks herein, Applicants respectfully request that the rejections set forth in the Office Action be withdrawn that claims 1-24 be allowed.

If any additional fees are due in connection with the filing of this Amendment, such as fees under 37 C.F.R. §§ 1.16 or 1.17, please charge the fees to our Deposit Account No. 02-4300; Order No. 033808.172.

Respectfully submitted,

SMITH, GAMBRELL & RUSSELL, LLP

By: Mary A. Montebello (#33,021)
for Frederick F. Calvetti, Reg. No. 28,557
1850 M Street, N.W., Suite 800
Washington, D.C. 20036
Telephone: (202) 263-4300
Facsimile: (202) 263-4329

Dated: March 7, 2006

FFC/MAM/brs

Enclosures: (1) Petition for Extension of Time
(2) Check for the sum of \$1020